

## MONSANTO HAS A MONOPOLY ON LIFE

Civil society and farmers' organisations worldwide reacted with outrage on 21 May to the 5-4 decision by the Canadian Supreme Court, affirming Monsanto's right to prosecute farmers who are found to have GM crops growing on their land, whether they wanted them or not.

Monsanto Company accused Saskatchewan farmers Percy and Louise Schmeiser of violating the company's patent on genetically modified canola (oilseed rape). Percy and Louise did not want Monsanto's GM canola seeds that invaded their property, and they did not try to benefit from the herbicide-tolerant trait in the GM seed (that is, they didn't spray Roundup weedkiller), but still Monsanto prosecuted them for patent infringement and demanded a portion of their income. The Schmeisers waged a courageous, seven-year battle against Monsanto that went all the way to the Supreme Court.

The Supreme Court's decision effectively nullifies the Court's 2002 decision that higher life-forms, including plants, are not patentable subject matter. According to the 21 May decision, a patent on a gene or cell can be infringed by a farmer's use of a plant or seed into which the patented material has been incorporated.

"Monsanto has won an inflatable patent today. They can now say that their rights



extend to anything its genes get into, whether plant, animal or human," said Pat Mooney, Executive Director of ETC Group, one of the interveners in the case.

The Canadian Court goes even further than notoriously monopoly-friendly US patent law because it finds that a gene patent extends to any higher organism that contains the patented gene. "Under this ruling, spreading GM pollution appears to be recognized as a viable corporate ownership strategy," said Mooney.

Monsanto's GM seed technology accounted for over 90% of the global area planted with GM seeds last year. The Court's ruling means that if a farmer is in

possession of seeds or plants containing a patented gene, the burden is on the farmer to prove that s/he is not infringing the company's monopoly patent.

"In Monsanto's world, we're all criminals unless a court rules otherwise," observes Silvia Ribeiro of ETC Group's Mexico office. "This will come as shocking news to indigenous farmers in Mexico, whose maize fields have been contaminated with DNA from genetically modified plants, and to farmers everywhere who are fighting to prevent genetically modified organisms from trespassing in their fields," said Ribeiro.

Monsanto's newspaper ads in Chiapas, Mexico, are already warning peasants that if they are found using GM seed illegally, they risk fines and even prison.

"No doubt Monsanto will say this is a victory for their stockholders, but its victory will be shortlived," said Pat Mooney. "This ruling will unite farmers and others opposed to corporate control of food and life, and galvanize civil society to take the issue out of the courts and back to politicians," said Mooney.

(Source: ETC Group news release, 21 May 2004, <http://www.etcgroup.org>)

## NEW STUN WEAPONS TO TARGET CROWDS

Weapons that can incapacitate crowds of people by sweeping a lightning-like beam of electricity across them are being readied for sale to military and police forces in the USA and Europe.

At present, commercial stun guns target one person at a time, work only at close quarters and have no effect on vehicles. The new breed of non-lethal weapons can be used on many people at once and operate over far greater distances.

But the advent of wireless stun weapons has horrified human rights groups, who are appalled by the fact that no independent safety tests have been carried out, and concerned by their potential for indiscriminate use. Robin Coupland of the Red Cross says they risk becoming a new instrument of torture, and Brian Wood of Amnesty International says the long-range stun guns could "inflict pain and other suffering on innocent bystanders".

(Source: New Scientist, 19 June 2004)



## INDIA'S GLOBAL TAKEOVER

A quiet metamorphosis is taking place in Asia as Indian companies buy up their rivals abroad. Last year, Indian firms took over more than 75 international companies. It started with acquisitions in the information technology and related services sector, but now it has spread far and wide to cover other industries.

In pharmaceuticals, Wockhardt has bought CP Pharma of the United Kingdom for \$10.85 million. Tata Tea, part of the Tata Group, India's oldest industrial conglomerate, has taken over Tetley of the UK, the world's biggest teabag maker, for US\$430 million—becoming the world's second-largest tea company in the process.

Among the most publicised deals, Tata Motors bought South Korean company Daewoo's truck plant in that country. Reliance Infocomm, belonging to India's largest privately held business house, Reliance Group, took over Flag International, a major telecom network.

A recent report by Goldman Sachs, for example, predicts that India will be the third-biggest economy by 2050—just behind China and the US, in that order.

In the UK alone, Indian firms have about 440 investments/joint ventures, with India being the eighth-largest investor. Last year, the top 92 Indian-American-owned companies in the US generated business of \$2.2 billion and provided full-time employment to about 19,000 in 2002. There are 1,441 Indian companies operating in Singapore; of these, more than 450 are technology enterprises.

(Source: *Asia Times Online*, 22 June 2004, [http://atimes.com/atimes/South\\_Asia/FF22Df04.html](http://atimes.com/atimes/South_Asia/FF22Df04.html))

## TV SCREEN LIGHT DEPRESSES SLEEP HORMONE IN CHILDREN

Exposure to television can influence melatonin levels in children and possibly contribute to the premature onset of puberty, according to a study by scientists from the University of Florence in Italy.

The study found a 30% increase in levels of the sleep-regulating hormone in children who had abstained from watching television for a week.

The findings are based on a study of 74 children from the Tuscan town of Cavriglia who volunteered to forego television, video games and computers for a week last month [May] in the interests of science. Aged between six and 12, the children normally watched an average of

three hours' television a day. Urine samples taken at the beginning and end of the experiment showed a significant rise in melatonin levels, particularly among the younger children, by the end of the television-less week. As well as blacking out the video screens, parents were asked to reduce the intensity of artificial lighting in their homes during the experiment.

Melatonin is a hormone produced by the pineal gland, a pea-sized organ just above the middle of the brain. Exposure to light during the day inhibits its production, which normally begins around 9 pm, with rising levels of melatonin in the blood making people feel sleepy.

Scientists are less certain about the role of the hormone in regulating the onset of puberty, an issue the Florence researchers intend to pursue. In Western societies, the arrival of puberty has advanced by about a year since the 1950s, when television became common.

It is the light from the TV set that is the supposed problem. Extra exposure to light lowers production of melatonin, says Roberti Salti of the University of Florence. (Sources: *Independent*, 27 June 2004; *New Scientist*, vol. 183, issue 2454, 3 July 2004)

## VERNESHOT HYPOTHESIS MAY EXPLAIN IMPACT CRATERS

The argument over what killed the dinosaurs has raged for 25 years and polarised into two opposing camps: those who support a meteorite impact; and those who favour a prolonged bout of megavolcanism—a "continental flood basalt".

But now a team from Geomar, an earth sciences institute at Kiel University in Germany, has come up with a completely new type of geological catastrophe to explain the death of the dinosaurs as well as three previous mass extinctions. If they are right, the culprit was neither a meteorite nor a flood basalt, but a colossal underground explosion called a Verneshot (named in honour of Jules Verne).

The Verneshot hypothesis attempts to explain a mystery that haunts the debate over why mass extinctions always seem to coincide with both continental flood basalts and meteorite impacts, when the odds of these happening simultaneously are vanishingly slim.

In the past 400 million years, there have been four major mass extinctions. Between 380 and 364 million years ago, the Frasnian–Famennian extinction pulses wiped out 60% of marine life. That was followed by the biggest extinction of all, when 96% of the world's species disappeared at the end of the Permian, 251 million years ago. There was another huge die-off at the end of the Triassic, 201 million years ago. And finally, 66 million years ago, the dinosaurs and numerous other groups met their end at the Cretaceous–Tertiary (K–T) boundary.

Each of these events is associated with both a meteorite impact and a continental flood basalt. Yet even one such double whammy is highly unlikely, so could it really have happened *four times*? Meteorite impacts large enough to trigger a mass extinction are believed to occur less



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than once every 100 million years. Continental flood basalts, meanwhile, happen roughly once every 30 to 50 million years and last for about a million years.

Geomar team leader Jason Phipps Morgan said that "the odds of a meteorite impact occurring at the same time as a continental flood basalt within the last 400 million years is around one in eight". But the probability of *four* of these coincidences happening within the last 400 million years is one in 3,500.

A Verneshot event could trigger a magnitude 11 earthquake and eject as much as 20 gigatonnes of rock into a "superstratospheric" trajectory before crashing back to earth, in some cases causing impact craters.

(Source: New Scientist, 8 May 2004)

## DNA STUDY SHOWS HUMANS AND CHIMPS NOT SO SIMILAR

Humans and their closest relatives, chimpanzees, may be more different than geneticists have realised. A comparison of the chimpanzee's chromosome 22 with its human counterpart, chromosome 21, shows that just 1.44% of the chromosome's 33.3 million DNA bases are different. The study also revealed nearly 68,000 insertions or deletions of DNA, most of which were only a few bases long.

But because each gene contains hundreds or thousands of bases, even these differences are enough to alter more than 80% of the proteins produced by those genes, says the International Chimpanzee Chromosome 22 Consortium (*Nature* 429:382).

(Source: New Scientist, 29 May 2004)

## MEDICAL IMPLANTS POWERED BY BODY HEAT

A company in New York state is planning to provide patients with an implantable power source that recharges the battery of their medical implant (i.e., pacemakers, defibrillators) using electricity generated by the patient's own body heat.

By continuously recharging the batteries, it saves the patient from frequent surgery. In some low power devices, it could even replace the batteries altogether, making such operations unnecessary.

The "biothermal battery", under development by Biophan Technologies of West Henrietta, will generate electricity using arrays of thousands of thermoelectric generators built into an implantable chip. These generators exploit the well-known thermocouple effect, in which a small voltage is generated when two of the junctions between two dissimilar materials are kept at different temperatures.

Today's pacemaker batteries last more than a decade before they need replacing. Biophan says the device it is aiming for will be able to extend this to three decades by continuously trickle-charging pacemaker batteries. It might even be able to power some low-power pacemakers directly.

(Source: New Scientist, 12 June 2004)

## CONTAGIOUS FLU VACCINES?

The dangers of vaccinating against flu if the vaccine is not a perfect match for the disease strain have been highlighted by a horse study.

Andrew Park's team at the Animal Health Trust near Newmarket, UK, tested

vaccines that were either identical or slightly different to a strain of flu infecting ponies. The ponies given mismatched vaccine were more likely to become infected and to excrete live flu virus, and also stayed infectious longer than ponies with a well-matched vaccine.

"The longer infectious period allows the virus more replication cycles and a greater chance to evolve," says co-author James Wood. And when the researchers put their results into an epidemic model, they found the risk of large outbreaks after using a mismatched vaccine to be up to 1,000 times higher than after a well-matched vaccination (*Proceedings of the Royal Society B*, DOI: 10.1098/rspb.2004.2766).

This kind of flawed vaccination may have allowed flu mutants to evolve in vaccinated poultry in Mexico (*New Scientist*, 27 March 2004). The work also raises further concerns about widespread poultry vaccination in China. A virulent new bird flu devastated birds across East Asia this year and also killed 22 people.

(Source: New Scientist, 19 June 2004)

## BACTERIAL INTEGRATED CIRCUITS CAN SENSE TOXINS

Using silicon chips to collect signals from specially altered bacteria, NASA-supported researchers at the University of Tennessee have created a device that can detect almost anything. Microbiologist Gary Saylor and colleagues have already used these devices, known as BBICs, or Bioluminescent Bioreporter Integrated Circuits, to track pollution.

NASA is interested in sensing contaminants because spaceships are tightly sealed. Unseen fumes from scientific experiments or toxins produced by moulds and other biofilms can accumulate and pose a hazard to astronauts. BBICs can be crafted to sense almost anything: ammonia, cadmium, chromate, cobalt, copper, lead, mercury, PCBs, proteins, ultrasound, ultraviolet radiation, zinc—the list goes on and on.

Microbes thrive in a wide range of environments, so it's possible to design BBICs that can survive in extreme or highly contaminated surroundings. "They can actually do their job sitting in things such as jet fuel/water mixtures," marvels Saylor.

BBICs are useful on Earth, too. They can detect formaldehyde emitted by pressed wood furniture and moulds often implicated in sick building syndrome.

"If this device works as planned, it could turn out to be a very inexpensive kind of



"The future isn't what it used to be."

monitoring system," says Saylor.

Advanced BBICs could serve as bioterrorism monitors, as a means to detect DNA radiation damage in astronauts, or as a diagnostic tool for doctors.

(Source: NASA Headlines, 10 June 2004, [http://science.nasa.gov/headlines/y2004/10jun\\_bbics.htm](http://science.nasa.gov/headlines/y2004/10jun_bbics.htm))

## A CLOSE CALL WITH ASTEROID TOUTATIS IN SEPTEMBER 2004?

On 29 September, a three-mile-long asteroid will make the closest predicted approach of any asteroid or comet to visit Earth in the next 30 years, say scientists at NASA's Jet Propulsion Laboratory Near-Earth Orbiting Programme Office. They predict the asteroid will come within 963,000 miles of Earth—a very near miss.

Asteroid 4179 *Toutatis* was named after a Celtic/Gallic god, and is one of the largest known Potentially Hazardous Asteroids (PHAs) that approaches our planet on a Near Earth Orbit (NEO).

Close encounters with Venus, Earth, Mars and Jupiter constantly alter the shape of the asteroid's path as it loops through the solar system every 3.98 years. On 31 October 2000, the asteroid passed less than 29 lunar distances from Earth. The 29 September 2004 fly-past will come within four lunar distances of the Earth.

*Toutatis* also has one of the strangest rotations yet observed in the solar system. Instead of spinning about a single axis, as do the planets and the vast majority of asteroids, it "tumbles" somewhat like a rugby football when it bounces.

At three miles long, it would present a terrible danger if it were to collide with the Earth, although scientists at NASA say this is unlikely. It is travelling at a speed of about 20 miles per second, and if it struck an ocean it would unleash a "mega tsunami" or giant tidal wave that could reach around the entire globe, inundating millions of hectares of land, destroying coastal habitations and killing perhaps millions of people.

If it hit land, it could annihilate an area the size of Europe and raise enough dust into the atmosphere to change the climate of the planet, causing a mini ice age that would freeze crops, destroy plant life and pre-empt a global famine.

An orbit simulation of the close approach of *Toutatis* is at <http://neo.jpl.nasa.gov/cgi-bin/db?name=4179>.

(Source: Ian Gurney, 5 February 2004)

## FROM BODY CLOCKS TO CHRONOTHERAPEUTICS

Chronobiology, as the study of body clocks is known, has already produced some curiosities. If you want to bet on when you might give birth naturally, go for between 4 am and 6 am. If you have osteoarthritis, it will hit you worst in the early evening. Your risk of an asthma attack is 300 times higher between 2 am and 6 am. Each disease, it seems, strikes hardest at a time of its own choosing.

It took decades of investigation for scientists to tease out the location of the body's master clock. Eventually, in mammals at least, it was narrowed down to a clump of just 20,000 cells in a part of the brain called the suprachiasmatic nuclei (SCN), a part of the hypothalamus at the base of the brain. Within the cells, scientists found a series of genes that switched on, off and back on again over a 24-hour period. This cycle has two knock-on effects: firstly, to send electrical pulses into the nervous system; and secondly, to produce squirts of hormones. Both spread through the body like the chime of a clock.

Scientists have since discovered that while the SCN beats out a standard time for the body, each of our organs uses the signal to set its own individual clock, much as countries set their time by GMT. Many organs, such as the liver and kidneys, are typically on New York time—five hours behind our master body clock.

Many working at the forefront of chronobiology believe that medicine has missed a trick by failing to take time variations into account. "Look at how we educate doctors and scientists. They're taught that the body is in a constant state over 24 hours, not that you get these cycles," says Michael Smolensky, an expert in body clocks at the University of Texas at Houston.

The upshot is that many in the medical profession, though aware that physiology changes with time, do not appreciate the implications.

Many experts in the field are convinced that if doctors and pharmaceutical companies appreciated how diseases vary with time, they could significantly improve their treatments. Studies have already shown that, in the case of certain diseases, taking drugs at different times has a marked influence on how effective they are.

The revelation that drugs work better at certain times has raised deep concerns among some in the scientific community who believe that it undermines how common chemical tests are performed.

Before a drug gets anywhere near a human, it is tested on animals, usually rodents. And your typical lab mouse is nocturnal. "It means we've been testing chemicals, and not just drugs, on animals whose physiology is 12 hours out of synch with our own," says Foster. "Does this mean we need to redo all of our toxicity testing? It's not out of the question."

Foster believes that the pharmaceutical industry could benefit from investigating how time affects the workings of its drugs. Doing so could not only reveal the best time to take a drug, but also when *not* to take it. "Say you test a new anticancer drug and it causes appalling side-effects and kills lots of animals. You decide you can't use that drug, and move on to another one," Foster says. "But if that drug had been tested at another time, say 12 hours later, it may have caused very few side-effects. So it could well be the case that not only are we giving drugs that cause more damage than necessary, but we are missing out on other very valuable drugs because they are nasty at the time they are tested."

Despite emphasising the shortcomings, though, Redfern doesn't rule out chronotherapeutics. "There may well be conditions like cancer, asthma, cardiovascular disease and epilepsy where this is worth looking at," he says.

"It's not like 10 years ago, when this was considered a bit off-the-wall. It's taken a lot more seriously now. We know it isn't fantasy."

### Further reading

- *Rhythms of Life*, by Russell Foster and Leon Kreitzman, Profile Books, 2004, ISBN 1861972350
- *Chronotherapeutics*, by Peter Redfern, Pharmaceutical Press, 2003, ISBN 0853694885
- *The Body Clock Guide to Better Health*, by Michael Smolensky and Lynne Lamberg, Owl Books, 2001, ISBN 0805056629
- *Chronobiology*, by Jay C. Dunlap et al., Sinauer Associates, 2003, ISBN 087893149X

(Source: by Ian Sample, The Guardian, UK, 1 July 2004)